TABLE 1.—*Snow on ground at end of March*

	Dawson	Barkerville	Fort McMurray	Edmonton	Battleford	Prince Albert	Le Pas	Calgary	Medicine Hat	Swift Current	Quappelle	Minnedosa	Winnipeg	Port Nelson	Port Arthur	White River
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1916	----	----	T.	----	----	4.0	9.0	0	----	0	4.0	4.0	4.0	81.0	14.0	*18.0*
1917	----	----	----	2.0	*5.0*	8.0	9.0	0	*0*	0	8.0	T.	T.	----	5.0	30.0
1918	----	30.0	10.0	T.	*T.*	*0*	0	0	0	*0*	*0*	0	*0*	9.5	0	12.0
1919	14.0	22.0	12.0	0	*2.0*	4.0	3.0	*0*	0	0	3.0	5.0	T.	20.0	*T.*	T.
1920	22.0	3.5	5.5	6.5	8.0	6.0	*10.0*	1.5	T.	*3.0*	6.0	9.0	3.0	40.0	0	0–12
1921	22.0	25.0	6.0	0	*4.0*	10.0	10.0	0	0	*0*	0	2.0	T.	----	0.5	8.0
1922	----	26.0	16.5	----	*10.0*	11.0	7.3	----	----	----	10.0	2.0	*2.0*	12.0	*T.*	12.0
1923	42.0	44.0	11.5	T.	*T.*	T.	8.0	0	T.	7	16.0	22.0	9.0	2.5	15.0	38.0
1924	21.0	26.0	8.5	2.0	*1.0*	*1.0*	2.0	*T.*	0	*0*	0	T.	*T.*	----	2.2	T.
1925	30.0	55.0	5.0	4.0	*1.0*	T.	1.0	----	----	----	0	T.	T.	----	14.0	7.0
1926	14.0	----	----	T.	*T.*	0	T.	*T.*	*T.*	T.	T.	T.	T.	----	2.0	12.0
1927	13.0	30.0	13.5	2.0	6.0	2.0	2.0	----	*3.0*	*4.0*	6.0	2.0	*2.0*	26.0	T.	0–15
1928	29.0	42.0	T.	0	*1.5*	3.0	*3.0*	*T.*	0	*T.*	*T.*	T.	0	----	4.0	14.0
Average	23.0	27.6	8.0	1.5	3.2	3.8	5.0	0.2	0.3	1.3	4.1	3.5	1.5	27.3	4.4	13.5

NOTE.—Figures in italics are interpolated.

TABLE 1.—*Snow on ground at end of March*—Continued

	Cochrane	Haileybury	Stonecliffe	Parry Sound	Southampton	Ottawa	Montreal	Quebec	Father Point	Chatham	Harrington	Sydney	Halifax	Anticosti
	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1916	36.0	24.0	18.0	*12.0*	----	7.0	T.	8.0	24.0	T.	----	T.	2.0	----
1917	*32.0*	28.0	6.0	T.	0.5	T.	T.	20.0	24.0	6.0	4.0	0	T.	23.0
1918	*12.0*	----	6.0	T.	1.0	T.	3.0	18.0	*19.0*	*10.0*	42.0	T.	3.5	16.0
1919	*5.0*	15.0	6.0	*3.0*	*0*	2.5	13.0	8.0	30.0	9.0	3.0	0	T.	6.0
1920	*T.*	T.	4.0	*3.0*	2.0	0	T.	1.0	10.0	4.0	----	0	0	42.0
1921	*5.0*	T.	*T.*	*T.*	*0*	0	0	1.2	*6.0*	0	*10.0*	0	T.	12.0
1922	*22.0*	20.0	*1.0*	T.	4.0	1.0	3.0	1.8	10.0	0	----	6.0	4.0	----
1923	*40.0*	----	*20.0*	24.0	15.0	14.0	17.4	44.0	54.0	22.0	----	34.0	10.0	38.0
1924	*5.0*	----	*5.0*	6.0	5.0	1.0	1.0	28.6	*21.0*	8.0	36.0	4.0	T.	7.0
1925	*28.0*	----	*8.0*	T.	*T.*	*T.*	T.	20.0	*19.0*	T.	----	0	*0*	19.0
1926	0	----	*11.0*	10.0	3.0	*5.0*	6.0	22.0	*30.0*	12.0	----	12.0	5.0	32.0
1927	*8.0*	----	*1.0*	T.	T.	*1.0*	*2.0*	3.0	*9.0*	4.0	----	16.0	T.	18.0
1928	10.0	----	*12.0*	12.0	6.0	5.0	15.0	48.0	*30.0*	8.0	----	1.0	T.	----
Average	15.6	14.5	7.5	5.4	3.0	2.8	4.3	17.2	22.0	6.4	19.0	5.6	1.9	21.3

FLIGHT OF RS–1, SAN ANTONIO, TEX., TO SCOTT FIELD, ILL.[1]

By WILLIAM E. KEPNER, Captain, Air Corps, U. S. A.

When over Memphis we were still unable to get in touch with Scott Field. The sky to the west had been gradually thickening up. The sun was still shining where the ship was. At 1: 20 p. m. there appeared a number of small rains traveling rapidly eastward across our path several miles ahead. The ship was headed about and we circled one of these with very little effect on the ship's stability. The ship was slowly circling to maneuver between several of these shower areas, when there appeared a specially favorable opening to the west. It looked as though there was a distinct wind shift line to the north and it was traveling nearly east. It was decided to fly into the apparently clear area to the west of Memphis and thus be well in rear of the squalls to the north.

Just as the ship was well on her course to the west and appeared to be running safely around the rain area, a deadly looking line squall, already perfectly developed, came racing across the sky from the northwest on a path that bid fair to interrupt the ship. To turn the ship either way was to lose time. The ship was allowed to drift slightly toward the rain on our left and the motors turned up to where the air speed was 53 miles per hour. However, the ship was being caught in the storm on our left. It was dragged rapidly in toward the center of the small disturbance and shortly afterward began to pitch and toss violently with an increasing tendency to rise in spite of even a 25° angle of descent. There was a sensation of being dragged backward and upward, with the ship out of control. There was nothing left but to run all motors at full speed. The ship was momentarily headed to the right and at an air speed of 65 miles per hour began to leave the rain squall. We were just out with a sickening plunge downward, when the line squall in the northwest appeared to be practically on top of us. This "line" was a coal-black body about 1,000 feet above the ground, with a bluish green color running underneath and all the way to the ground. From the black line great chunks of cloud were frequently thrown off, with an appearance of being immediately torn to pieces in the disturbed air just beneath. The airspeed indicator began to jump from gusts that we began at once to feel on the ship's nose. The ship would shudder as though it had bumped into something. The ship was turned as quickly as possible with such high speed, to the left and around the rear of the storm we had just left. We barely missed the northwest line squall and were in fair weather, heading southeast with the motors again throttled to cruising speed. There was a line of squalls bearing to the south, west, and northeast.

An inspection of the ship disclosed that the rigid nose had given way just where the longitudinals meet and make the nose tip. The solid cone plate, to which all girders were bolted, had broken all around and each longitudinal end was swinging free. Only two longitudinals beside the main keel structure remained solidly in place. The entire top of the nose had given way at the tip. A couple of the spacer girders that make a ring about half way back were crushed, and the nose cover was torn somewhat. The longitudinals were pushed back into place and the ends laced together with cable in an effort to approximate a new nose tip. The repair seemed satisfactory under the circumstances.

It was then 2:10 p. m. and we were traveling east. The squalls appeared to make a line across the north, west, and south. I planned to fly east and, if possible, land near Nashville, Tenn., refuel, and then outrun the storm to Langley Field, Va.

At 2:30 p. m. another line appeared across the east, and we seemed to be trapped completely. The circle of storms was about 30 miles in diameter. This was rapidly becoming less and less. When the border appeared about 5 miles away in all directions, there was a small break to the south. It was apparently our only chance, and I decided to take it. We could not afford to be caught in the center of all those approaching storms.

We moved cautiously into the opening southward. There was rain to our left and another line squall, not so well developed, on our right. With a crippled nose, it was decided to push the ship only so far as was absolutely necessary. The ship was alternately dragged first to the left, then to the right, as we would be near first one storm, then the other. When it appeared we were successfully getting through, there was an icy draft through the control car from our right, and the ship was running directly sideways to the left at an increasing

[1] Extract from official report made to Chief of Air Corps, Washington, D. C., October 18, 1928.

speed until I would estimate it to be at least 50 miles per hour. Our speed forward was 53 miles per hour. The ship was again turned to the right, but not daring to give it any more speed forward, we were unable to pull out as had been the case in the first squall. The ship was sucked rapidly into the storm on our left and quite suddenly began to rise rapidly in a very cold air that was attended by a veritable cloud-burst of water. All available valves were opened to relieve the internal pressure. As the ship soared up there was a sensation of being tossed about like a leaf, with violent shudders passing through the ship. The suspension cables on the cars shrieked with a sound similar to a diving airplane. It seemed as though something must give way in the ship's structure. The bag over the cars seemed to breathe with a great surging of gas that caused a change in the apparent cross-section shape.

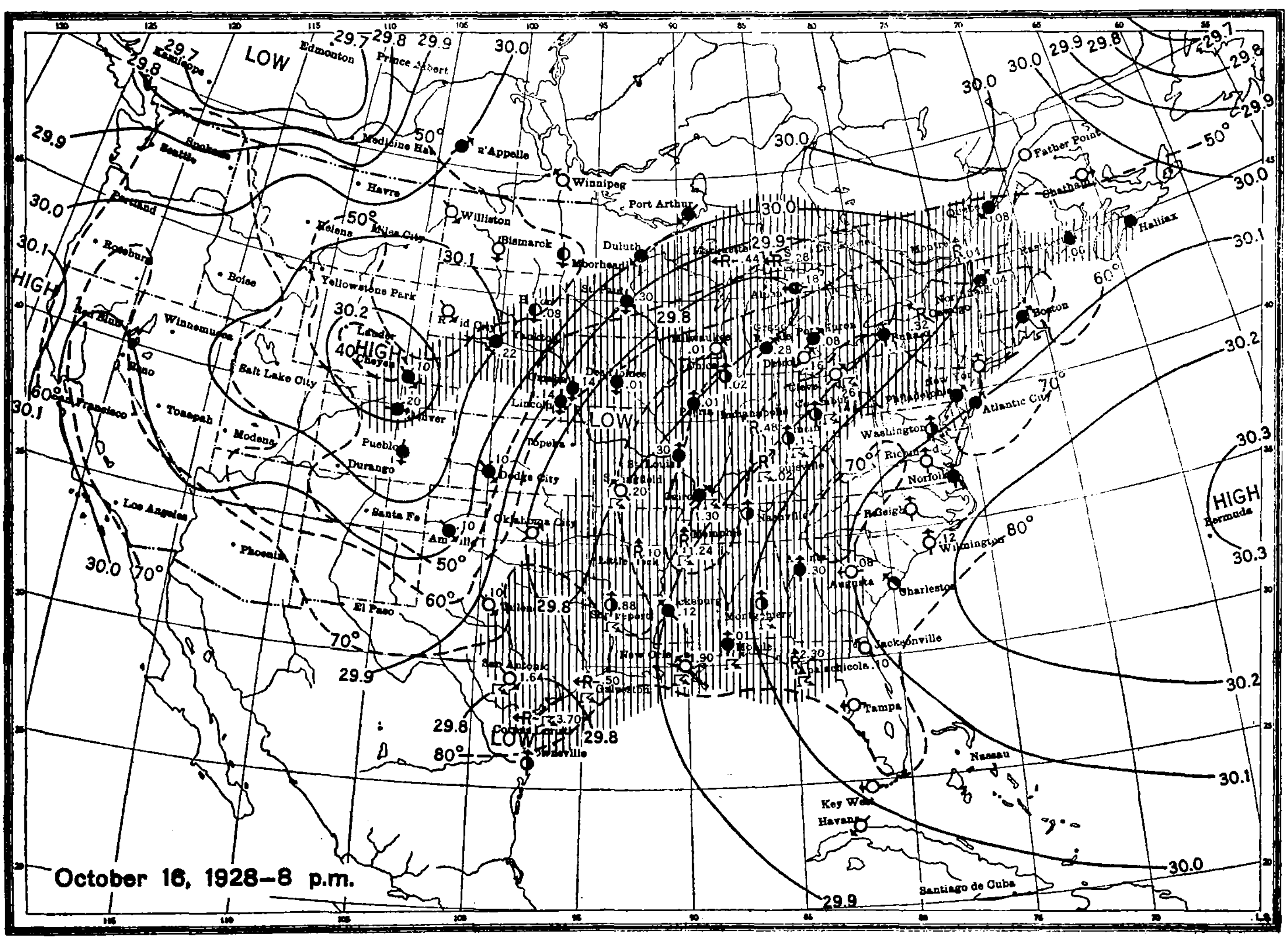
The elevators were put "hard down," and at 2,000 feet altitude the ship went into a dive of approximately 45°. Gasoline and ballast were dropped to check the fall. Everyone had to hang on, as it was impossible to stand up. All the way down the elevators were "hard up," and the ship leveled off just in time to avoid crashing. Then it immediately started rising again, very rapidly. This time it did not reach the same altitude, but repeated the dive, and again came out just in time to avoid crashing. There was apparently a blanket of very dense air on the ground that each time assisted the ship to avoid crashing. Due to our low air speed, we were not coming out of the storm very fast, and it was a battle for 15 minutes of at least six or seven sickening ascents and descents that gradually dampened out until we were finally out in a clear area to the south. We had barely reached the storm's edge when a blinding flash of lightning occurred in the center of it, and near the tail of our ship. It, however, did no damage. The wind outside this area was flowing gently from the north and a fog was forming just off the ground. The sky was clearing to the northwest, and the ship was headed in that direction. We were then 50 miles southeast of Memphis, Tenn.

An inspection of the nose showed considerable further damage. The laced ends had held, but due to the consequent flexibility, the cross bracing girders had practically all crumpled. Eight of the spacer girders had been crushed and several small holes had been punched in the gas envelope. The exposed ends of broken girders were wrapped with blankets for a padding to prevent further punctures of the gas bag. The holes were repaired. A test of flying showed that we could safely proceed at 40 miles per hour. It was then 4:30 p. m.

We received a message that conditions were favorable at Scott Field and proceeded in that direction, where we landed at 10:10 p. m., October 16, 1928.

DISCUSSION

At the time of the bad weather experienced by the *RS-1* a trough of low pressure extended from Michigan southwestward to eastern Kansas, and thence southward to the mouth of the Rio Grande. (See figure.) This trough was a part of a very extensive area of low pres-



sure that had been drifting slowly eastward for several days prior to October 16. During this period warm, humid air from the Caribbean Sea and the Gulf of Mexico had been steadily moving northward over the Mississippi Valley, while a HIGH from the Pacific Ocean had been advancing eastward over the Plateau and Rocky Mountain regions, bringing cooler air down the eastern slope of the Rockies and over western Texas by 8 a. m. of the 16th. The kite flight at Groesbeck, Tex. (started at 5:54 a. m.), shows that there had been an increase in both humidity and temperature up to 2 kilometers above the surface, and a slight decrease in temperature at the top of the flight (about 2,300 meters above the surface) since the flight 24 hours previously. This condition, increase of the lapse rate and of the humidity below the 2-kilometer level, rendered the air quite unstable and made the conditions favorable for active convection and the development of more or less violent thunderstorms a little later in the day in eastern Texas.

The air movement being from southwest to northeast, this same condition extended rapidly northeastward over Arkansas and extreme western Tennessee during the day. It was in the late afternoon that conditions quite similar to those shown by the Groesbeck kite flight set in over extreme western Tennessee and resulted in the violent thunderstorms experienced by the *RS-1*.—*Chas. L. Mitchell.*

CONICAL SNOW

By WILSON A. BENTLEY

Every late autumn and early spring there occur at Jericho, in northern Vermont, and of course at other similar locations, several falls of conical snow, and also an occasional one in winter. This sort of snow comes only out of cumulo-nimbus clouds, and more commonly when the surface temperature ranges from 34° to 44° F. Conical snowflakes have a granular texture and are built up mainly from countless undercooled cloud droplets that have frozen loosely together. Their greatest diameter ranges from one-sixth to one-third inch. The writer assumes, from a long-time study of this form of snow, that the nuclei usually, if not invariably, consist of branching tabular crystals.

It is of much interest to consider the conditions within a cumulus cloud that conspire to make the undercooled droplets so arrange themselves upon a tabular snow crystal as to form a granular snow cone. It is certain that, owing to its lightness, a tabular branching snow crystal within a cumulo-nimbus cloud, is first wafted upward and about by turbulent air currents. This causes it to become thickly coated on both sides with frozen cloud droplets, or granular snow. It now begins to fall with the denser side turned downward, and since it falls faster than the cloud droplets light granular material then rapidly collects on (is caught by) the under face thereby destroying the former gravitational equilibrium of the mass and causing it to upset, whereupon the granular snow is caught exclusively, or nearly so, by the new underside, and thus the whole converted into a more or less well-defined double cone with its abutting bases on the opposite sides of the initial tabular crystal. It is conceivable, given a cumulo-nimbus cloud of sufficient thickness, that additional upsettings might occur and thus cause the double cone to become more nearly symmetrical about its basal plane than it otherwise would be.

NOTE.—The phenomenon here described is much like, if not identical with, soft hail or graupel—free-air wads of rime, presumably, built up on snow crystals.—*Editor.*

ALFRED JUDSON HENRY, 1858–1931

Those of us who have had the privilege of watching the development of Government institutions can not fail to realize that the character of their personnel has been a potent factor in determining policies and attainments. Usually a few outstanding men have played a major part in this formative work.

The Weather Bureau has been fortunate that among its officials have been many men who sought not position but opportunity to do useful work. The subject of this notice is an outstanding example of a public benefactor of this type. Born in New Bethlehem, Pa., on September 1, 1858, he enlisted in the meteorological section of the Signal Corps, U. S. Army, in July, 1878, while in his twentieth year. Having finished the usual course of instruction in military tactics and meteorology at Fort Whipple, now Fort Myer, Va., and being exceptionally efficient as a telegraph operator, he was detailed for duty on military telegraph lines, first on the Atlantic Coast, and later on the then frontier in Texas. This was an unpleasant and difficult assignment, but in two years he had won a sergeancy, and in 1883 was called to Washington for duty in the office of the Chief Signal Office. In October, 1888, the Central Office force was given a civilian status, and from that time on Henry's advancement was rapid. In 1900 he was promoted to the position of Professor of Meteorology, and when this grade was abolished in 1910 his designation became simply Meteorologist. Later under classification of Federal employees he was advanced successively to Senior Meteorologist and Principal Meteorologist, which latter title he held until the time of his death on October 5, 1931.

Professor Henry held many important assignments, in the Weather Bureau, such as Chief of Meteorological Records Division, Chief of the River and Floods Division, Official Forecaster at Washington, in Charge of the Research Observatory at Mount Weather, Va., and finally, Editor of the Monthly Weather Review. He also was a member of numerous Weather Bureau boards that had to do with the shaping of Bureau policies.

Professor Henry was educated in the common schools, with one year in high school and one year in Reid Institute, Reidsburg, Pa. He also studied for two years at the Columbian University (now George Washington) in Washington, D. C.

He was author of several important works: "Rainfall in the United States," "Climatology of the United States"; "Weather Forecasting from synoptic charts"; "Weather Forecasting in the United States" (co-author); "The Floods of 1913 in the rivers of the Ohio and lower Mississippi Valley"; "Upper Air Investigations at Mount Weather, Va.;" and numerous papers on various phases of climatology and kindred subjects.

Professor Henry's fellow workers will cherish his memory, not alone for his scientific attainments, but